भारतीय मानक
Indian Standard

IS 13182 : 2020

भवनों के नम क्षेत्रों को नमी-सह और जल-सह बनाना — सिफारिशें

(पहला पुनरीक्षण)

Waterproofing and Damp-Proofing of Wet Areas in Buildings — Recommendations

(First Revision)

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Waterproofing and Damp-Proofing Sectional Committee had been approved by the Civil Engineering Division Council.

Bathroom, kitchen, water closet and to a lesser extent verandah, balconies may be termed as wet areas of a building which are more vulnerable to seepage of water due to their location and functional requirements. These wet areas are one of the main sources of seepage and dampness in a building which leads to unhygienic conditions affecting badly the health and comfort of inhabitants and may seriously deteriorate the durability of a building. The causes of dampness and leakage may be due to defective design, sub-standard material, improper execution and incorrect usage by the occupant.

This standard was first published in 1991 and was intended to provide guidance on provisions for preventing dampness and seepage arising out of the wet areas of a building under construction. Problem of seepage and dampness in a building already in use require a different approach in the analysis of causes and remedial measures.

In this first revision of the standard, the following significant changes have been made:

a) Requirements of materials for waterproofing of wet areas have been included.
b) Provisions on application of waterproofing materials in wet areas have been detailed.
c) Provisions on shower areas have been included.
d) Typical sketches detailing various junctions treated with waterproofing materials have been included.
e) Design considerations in wet areas have been included for information in Annex B.
f) Additional associated terminologies and related cross-referred standards have been included.

In the formulation of this standard, considerable assistance has also been derived from Australian Standard, AS 3740 : 2010 'Waterproofing of domestic wet areas'.

The composition of the Committee responsible for the formulation of this standard is given at Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

Indian Standard

WATERPROOFING AND DAMP-PROOFING OF WET AREAS IN BUILDINGS — RECOMMENDATIONS

(First Revision)

1 SCOPE

1.1 This standard provides recommendations for planning, construction and installation aspects for waterproofing/damp-proofing of wet areas of a building which includes kitchen, bathroom (rest room), water closet, food court, restaurant, verandah, balcony, laundry areas, dying areas, shaft, external wall and domestic overhead tank.

1.2 Certain areas some of which as given below are beyond the scope of this standard:

a) Precast/modular construction,
b) Pump/chiller plant room,
c) AHU room,
d) AC units condensate drainage,
e) Roof drainage,
f) Podium drainage,
g) Sumps,
h) Refuge area,
j) Labs and medical equipment room,
k) Swimming pools and similar water retaining structures,
m) Public overhead/ground/underground water tanks,
n) Large water retaining bodies, and
p) Planters.

NOTE — Provisions for external walls and sunshades are intended to be covered under a separate standard.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subjected to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Adhesive — A non-metallic gluing or cementing substance applied on the surfaces to bind surfaces of two separate items or blocks to bind them together and resist their separation.

3.2 Balcony — A horizontal projection, including a handrail or balustrade/parapet, to serve as passage or sitting out place, normally exposed to atmosphere.

3.3 Bath Room — A bath room is a place for taking bath either from a shower or with the help of bucket and mug and in some cases using a bath tub.

3.4 *Chajja* — A sloping or horizontal structural overhang usually provided over openings on external walls to provide protection.

3.5 Kitchen (Pantry) — Kitchen (pantry) is a room meant for cooking food, wherein provision for washing used utensils and raw materials required for cooking is given.

3.6 Verandah — A covered area with at least one side open to outside with the exception of 1 m high parapet on the upper floors to be provided on the open side.

3.7 Water Closet — The room or compartment, in which a water-flushed plumbing fixture designed to receive human excrement directly from the user of the fixture, is placed.

3.8 Waterproof (WP) — The property of a material that does not allow water to penetrate through it.

NOTE — For the purposes of this standard, for materials deemed to be waterproof and suitable for including in a waterproofing system (*see* **4.4.1**).

3.9 Waterproofing System — A combination of materials that are required to achieve a waterproof barrier as required by this standard (for example, substrate, membrane, bond breakers, sealants and finishes).

3.10 Water Resistant (WR) — The property of a system or material that restricts moisture movement and will not degrade under conditions of moisture.

3.11 Water Stop — A vertical or horizontal as the case may be extension of the waterproofing system forming a barrier to prevent the passage of moisture in the floor.

3.12 Wet Area — An area within a building supplied with water from a water supply system, which includes bathrooms, showers, laundries, sanitary compartments, kitchens/pantries, bar areas, kitchenettes and domestic food and beverage preparation areas.

3.13 Wicking — The action of water rising by a capillary path.

4 MATERIALS

4.1 General

This section sets out requirements for acceptable materials to be used in the waterproofing of wet areas.

4.2 Design and Installation

Waterproofing systems and their installation details shall be designed in such a way to create a water resistant barrier against movement of water through seepage, wicking, leakage or in any other manner across the intended surface or volume so as to keep the other side free from dampness or ingress of water. Details of waterproofing system shall be provided in sufficient details with clear lines, dimensions, key diagrams and noting to implement the waterproofing scheme at site as envisaged by the designers. Waterproofing systems shall be compatible to resist the followings:

a) *Differential movement due to*,
    1) actions as defined in IS 875 (Parts 2 to 5);
    2) shrinkage and expansion of substrate materials, framing and finishes;
    3) temperature variations; and
    4) movement tolerances as per respective standards.
b) *Exposure to,*
    1) cleaning chemicals [such as detergents, sodium hypochlorite (bleach)]; and
    2) alkalis from cement mortar.

4.3 Movement Joints

The waterproofing system shall accommodate the expected movement at movement joints in the substrate.

4.4 Materials

4.4.1 *Materials of Waterproofing Systems*

For the purpose of this standard, the following materials used in waterproofing systems shall be deemed to be waterproof:

a) Flexible waterproof sheet flooring material with waterproof joints of the sheeting;
b) Liquid membrane (two component or single component); and
c) Flexible waterproof coating with resistance to ingress of moisture under pressure.

NOTES

1 There is no need for a water stop at the general room doorway when using this material.

2 Part mixing shall not be carried out in the site.

4.4.2 *Water-resistant Substrates*

For the purpose of this standard, the following materials used in waterproofing systems, in conjunction with water-resistant surface materials in accordance with **4.4.3**, shall be deemed to be water resistant:

a) *Walls:*
    1) Concrete mix designed as per IS 10262 and placed as per IS 456, to resist moisture movement;
    2) Cement render treated to resist moisture movement;
    3) Fibre cement sheeting;
    4) Water-resistant plasterboard sheeting;
    5) Masonry in accordance with IS 1905; and
    6) Water/moisture resistant plasterboards as per IS 2095 (Part 1).
b) *Floors:*
    1) Concrete mix designed as per IS 10262 and placed as per IS 456, to resist moisture movement;
    2) Compressed fibre cement sheeting;
    3) Fibre cement sheeting, and supported on a structural floor;
    4) Flooring grade particleboard sheeting; and
    5) Structural plywood manufactured in accordance with IS 10701.

4.4.3 *Water-resistant Surface Materials*

For the purpose of this standard, the following surface materials are deemed to be water resistant for the locations listed:

a) *Walls:*
    1) Thermosetting laminated sheet.
    2) Pre-decorated fibre cement sheeting.
    3) Tiles when used in conjunction with a substrate listed in **4.4.2**.

    NOTE ─ Porous tiles can have discolouration caused by water absorption and migration.

    4) Water-resistant flexible sheet wall material with sealed joints (for example, sheet vinyl or linoleum) when used in conjunction with a substrate listed in **4.4.2**.
    5) Sanitary grade acrylic wall linings, minimum 1 mm thick flexible and elastic acrylic cementitious coating.
    6) Water/moisture resistant plasterboards as per IS 2095 (Part 1).

b) *Floors (when used in conjunction with a substrate listed in* **4.4.2***):*
   1) Tiles (includes natural and artificial stones).

      NOTE — Porous tiles can have discolouration caused by water absorption and migration.
   2) Water-resistant flexible sheet flooring material with sealed joints using preformed/liquid sealants (for example, sheet vinyl and linoleum).

4.5 Preformed, Prefinished Shower Bases and Enclosures

Materials used in the manufacture of preformed, prefinished shower bases and enclosures shall be such that the finished product is waterproof.

4.6 Sealants

For the purposes of this standard, all sealants shall be,

a) waterproof;
b) flexible (elastomeric);
c) mould-resistant;
d) compatible with adjacent materials; and
e) non-sagging.

4.7 Adhesives

Adhesives used in a waterproofing system shall be,

a) Waterproof, where used to adhere other waterproof materials; and
b) Compatible with the materials to which they are adhered.

5 SOURCES OF SEEPAGE OR DAMPNESS AND RECOMMENDATIONS FOR PREVENTION

5.1 General

Use of sub-standard and non-standard materials or poor workmanship is one of the major causes of seepage/dampness in buildings. Hence, all the appliances, fixtures and materials shall conform to the relevant Indian Standards where they exist and shall have good workmanship. Further, water pressure in concealed pipelines shall not exceed the design pressure, which otherwise may lead to breaking of pipe/leaking of water.

5.2 Water Closets

5.2.1 *Sources of Leakage and Dampness (see Fig. 1)*

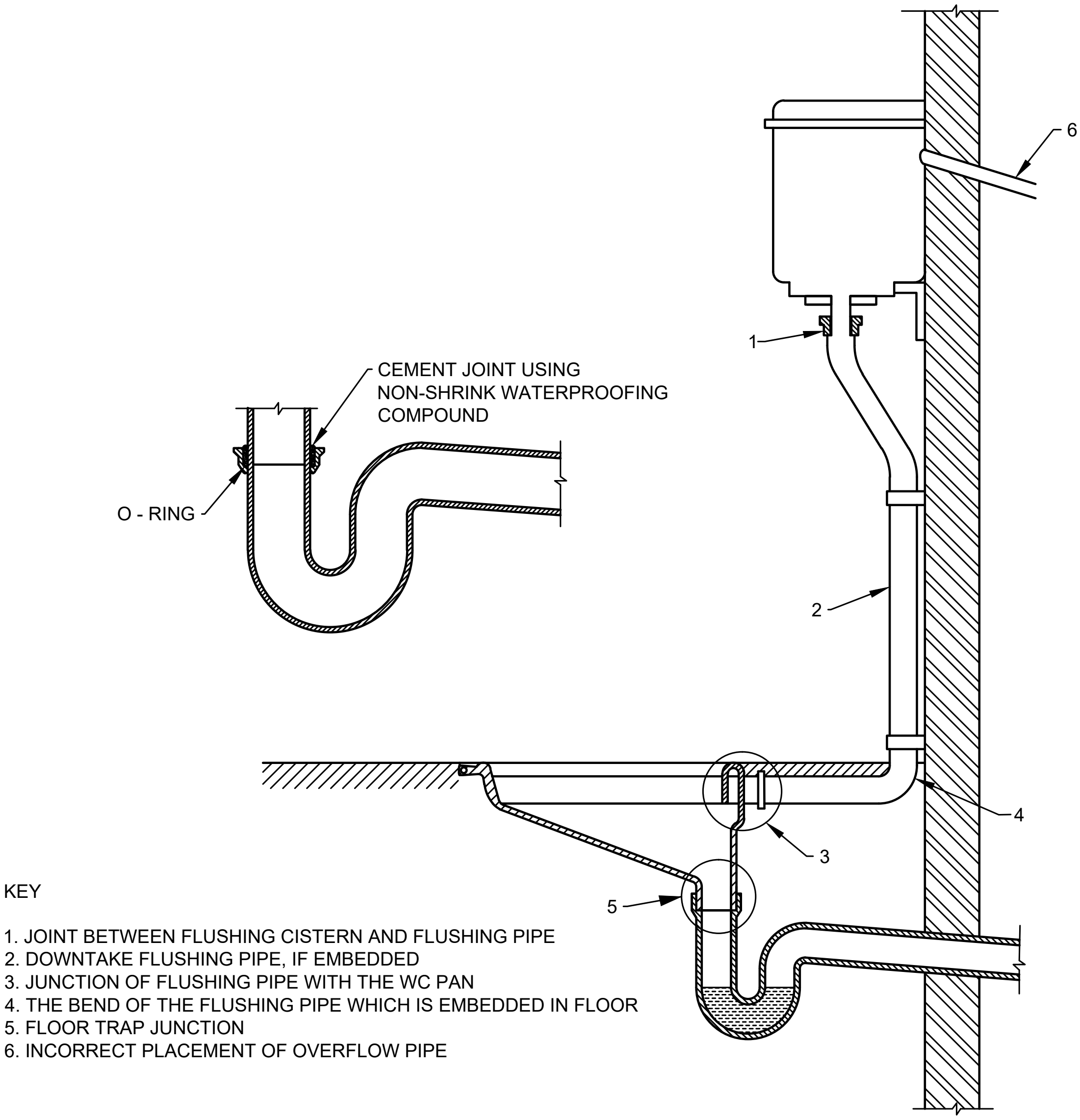
The following are some of the sources:

a) Joint between flushing cistern and flushing pipe.
b) Use of down take flushing cistern pipe made of material susceptible to corrosion.
c) Junction of the flushing pipe with the WC pan.
d) Junction of WC and foot rest with flooring.
e) Junction of WC and traps with the branch pipe.
f) Depressed/sunken reinforced concrete slab to accommodate the pan and trap.
g) Joints between flooring tiles and wall tiles/cladding joints.
h) Incorrect placement of overflow pipe.
j) Floor trap junction.
k) Faulty pipe joints.
m) Cut out in the structure for the branch pipe.
n) Indian type WC fixed loosely.

5.2.2 *Recommendations for Prevention of Leakage and Dampness*

The following recommendations are suggested:

a) The flush pipe shall be securely connected to the cistern outlet and made airtight by means of a coupling nut. The nuts made of injection-moulded HDPE/PVC may be used only if the end pipe is also made of HDPE/PVC.
b) Flush pipe made of tin shall not be used as it is liable to corrode.
c) Where GI pipe or any other type of pipe/fitting is passing through the floor/wall section, the same should be wrapped with a min 75 mm wide double-sided bituminous waterproofing tape to ensure sufficient bond between the pipe outer surface and the non-shrink cementitious grout used to fill the gaps around the pipe outer surface and the wall/floor surfaces.
d) Flush pipe should be properly fixed to the entry hole of the WC pan with the help of rubber gasket or good quality putty (acrylic or cement based).
e) Where squatting pan with traps are provided, due consideration shall be given to the following:
   1) Firstly, temporary laying of pipe line and WC pan should be done by giving temporary packings. The level should be checked and corrected taking into account the final finish level of flooring. The WC pan may be taken out and pipe joints filled up. After WC pan is fitted and jointed, cement concrete block should be put around this joint and then depressed portion filled up with light weight filler materials, such as cinder, which shall not be cemented for convenience of repair works, if required later.
   2) A suitable slope should be given to the depressed RCC floor which accommodates the pan and trap to lead the water to the rear portion of WC pan. The slab should not be depressed much beyond what is necessary that is only that portion of the RCC slab which accommodates the pan and the trap should be depressed. A corrosion resistant GI pipe of 25 mm dia should be provided to drain off any water accumulated in the depressed area (*see* Fig. 2).



KEY

1. JOINT BETWEEN FLUSHING CISTERN AND FLUSHING PIPE
2. DOWNTAKE FLUSHING PIPE, IF EMBEDDED
3. JUNCTION OF FLUSHING PIPE WITH THE WC PAN
4. THE BEND OF THE FLUSHING PIPE WHICH IS EMBEDDED IN FLOOR
5. FLOOR TRAP JUNCTION
6. INCORRECT PLACEMENT OF OVERFLOW PIPE

Fig. 1 Sources of Leakages in Water Closets and Flushing Cisterns

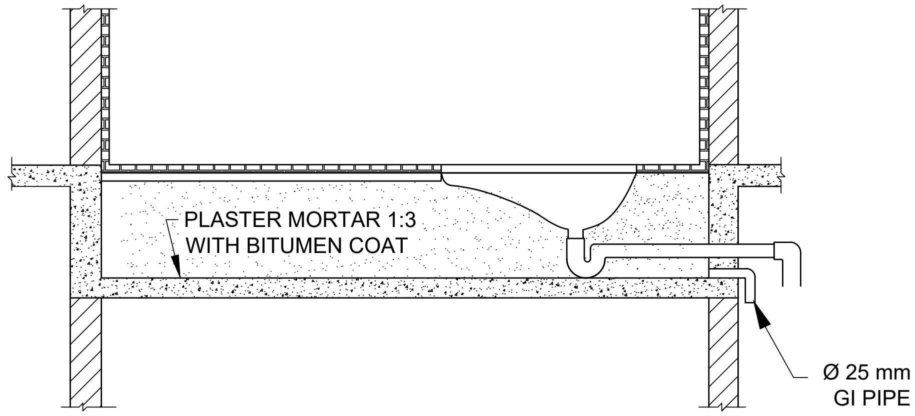
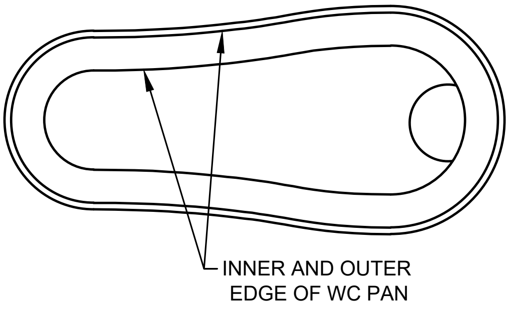


Fig. 2 Typical Sketch of Depressed Slab and Arrangement of Joints in WC

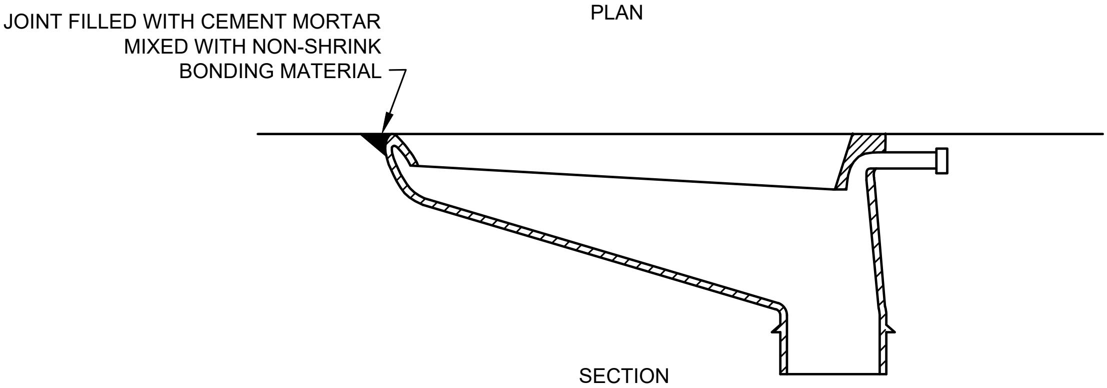
3) In addition to the draining of the depressed portion, the depressed area should be made waterproof. For this, depressed portion should be plastered with cement mortar 1:3 and a coat of 85/25 grade bitumen conforming to IS 702 at the rate of 1.5 kg/m^2 should be applied over it. Alternatively, suitable waterproofing coating or waterproof cement plaster should be used.
4) Finished floor should be sunk by 25 mm from the adjoining floor and walls up to at least 300 mm shall be made from an impervious material such as cement plaster (smooth finish), terrazzo *in-situ* or tiles, glazed and ceramic tiles.

NOTE — The depth can be modified to 12 mm in place of 25 mm or ramp may be provided to facilitate accessibility of wheel chairs.

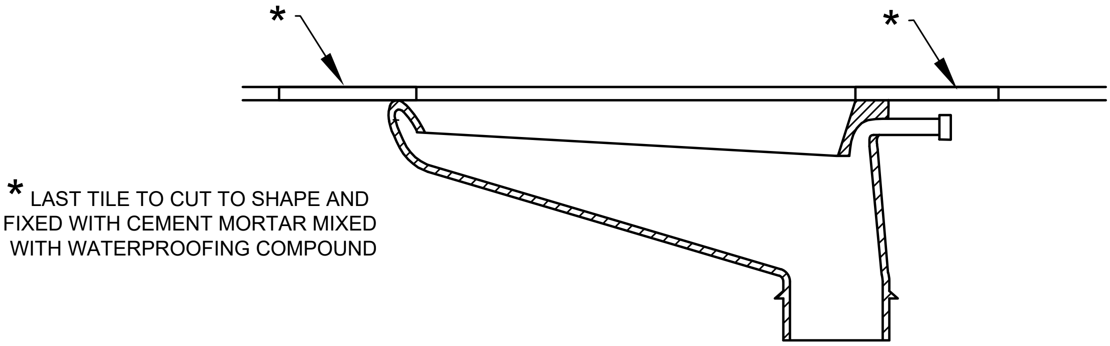
f) Where the bath and Indian type WC are accommodated in a single toilet connected to septic tank, the slope of floor in bath area should be away from the WC to avoid drainage of soapy water.
g) Where squatting pan is fixed with rim in line with tile flooring below the flooring the junction of flooring tiles and rim is the main point of leakage. To avoid this, suitable non-shrink, bonding material (its chloride limit should be less than one percent in the waterproofing agent) should be used for fixing the last tile and the joint between the flooring and the rim of the WC (*see* Fig. 3).
h) As far as possible integral tread WC pan should be preferred to avoid seepage from the joints. Where separate footrest is used, the joints between tread and flooring should be made leak proof by using non-shrink waterproof mortar.



PLAN



SECTION


*
*
* LAST TILE TO CUT TO SHAPE AND
FIXED WITH CEMENT MORTAR MIXED
WITH WATERPROOFING COMPOUND

SECTION (ALTERNATE)

FIG. 3 FIXING OF INDIAN TYPE WATER CLOSETS

j) Flooring tiles to be laid on top of a minimum 1 mm thick flexible and elastic acrylic cementitious waterproof coating which is seamless and impervious membrane. All the joints shall be filled with waterproof tile joint filler. Cementitious polymer modified and waterproofing tile adhesive for tile fixings should be flexible to accommodate thermal and physical movements, and should be slip-resistant.

k) The overflow pipe from cistern be brought right up to floor level and provided with right angle bend at the outlet over floor (*see* Fig. 4). Outlet pipe to be wrapped in the centre of the floor/wall section waterproofed with a minimum 75 mm wide double sided bituminous tape and annular gap around the pipe outer surface to be grouted/ sealed with free flowing non-shrink cementitious waterproof grout.

m) In the European type WC, the WC is fixed by screws using rubber washer to the floor and the wall. Rubber gasket should be used at the joint to avoid leakage. The junction between pan pedestal with flooring should be filled with cement mortar mixed with non-shrink waterproofing compound (*see* Fig. 5).

n) The joint between the pan and trap shall be made leak proof with cement mortar 1 : 2 or 1 : 3 with non-shrink waterproofing compound or with a suitable gasket.

p) As far as possible jointless floor should be laid, however, where flooring tiles have been used these shall be laid on bed of waterproofing mortar and care should be taken to fill the joints effectively.

q) The cut out hole made for outlet pipe should effectively be sealed with waterproof cement mortar after the pipes are fixed.

r) Joints between trap and Y junction may be negotiated with long arm bend to avoid joints coming in the wall (*see* Fig. 2).

5.3 Bath Room

A waterproofing system for a bathroom floor may include lining it with a material in accordance with **4.4.1** (b) or (c) or by using a waterproof flexible sheet flooring material in accordance with **4.4.1**(a).

5.3.1 *Sources of Leakage and Dampness*

The following are some of the sources:

a) Junction of water pipe and floor/wall,

b) Floor and wall where shower splashes water,

c) Junction of door frame and floor on account of eventual rotting of door frame,

d) Wash basin,

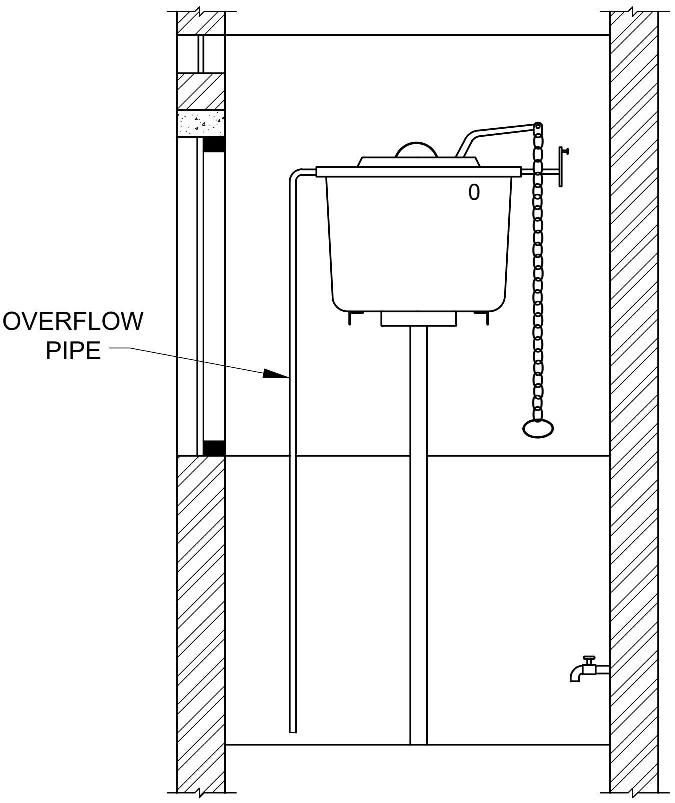


Fig. 4 Typical Arrangements of Overflow Pipe from Cistern

e) Concealed piping and fitting,

f) Improper slope,

g) Joints between flooring tiles,

h) Cut out in the structure for the branch pipe, and

j) Floor trap junction (*see* **5.6**).

5.3.2 *Recommendation for Prevention of Leakage and Dampness*

The following recommendations are suggested:

a) The floor of every bath room shall be constructed of material which does not readily absorb moisture and entire floor should be sunk by 25 mm from the adjoining floor. Surface of the wall and floor should be coated with impervious material. The floor should be sloped away from the door (entrance) towards the outlets, a slope of 1:100 is recommended.

b) Bath room floors and walls to a height of at least 1 m from the finished floor and in case shower is provided 2.1 m from finished floor shall be made of impervious material, such as waterproof cement plaster/bedding mortar/screed, waterproofing coating (smooth finish), terrazzo *in-situ* tile, glazed tiles. Cement plaster to be mixed with integral liquid/powder waterproofing compound (as per IS 2645)/latex based bonding admixture, should be corrosion-resistant, reducing shrinkage cracks.

c) In case of concealed pipes, before plastering the joints and connection shall be tested according to IS 1742.

d) For cut out procedure explained in **5.2.2** (r) should be followed.

e) As far as possible jointless floor should be laid, however, where flooring tiles have been used these shall be laid on bed of waterproof mortar and care should be taken to fill the joints effectively. Flooring tiles shall be laid on top of a min 1 mm thick flexible and elastic acrylic cementitious waterproof coating which is seamless and impervious membrane. All the joints shall be filled with waterproof tile joint filler.

5.3.3 *Preformed Shower Bases*

Preformed shower bases shall be supported to prevent distortion or cracking, and shall be sufficiently recessed into the wall to allow the water-resistant surface materials to pass down inside the perimeter rebate over the upstands of shower base.

When installing preformed shower bases, integrity of the structure shall be maintained.

NOTES

1 For typical base junction (*see* Fig. 6A and Fig. 6B).

2 Ventilation is required to allow evaporation of water leaking around the edge of the bath into the enclosed airspace under the bath.

5.3.4 *Penetrations*

5.3.4.1 *Shower areas*

Penetrations for taps, shower nozzles, recessed soap holders and similar fixtures shall be waterproofed by sealing with proprietary flange systems or a sealant. When sealing the tap body to the wall, allowance shall be made for the servicing of tap washers or ceramic disks without damaging the seal.

For mixer taps, drainage shall be allowed at the base of the cover plate.

Any penetrations of mechanical fixings or fastenings through surface materials shall be waterproofed.

5.3.4.2 *Tap penetrations through horizontal surfaces*

Tap penetrations on horizontal surfaces surrounding baths and spas shall be waterproofed by sealing with proprietary flange systems or the tap body to the membrane, or substrate where a membrane is not required.

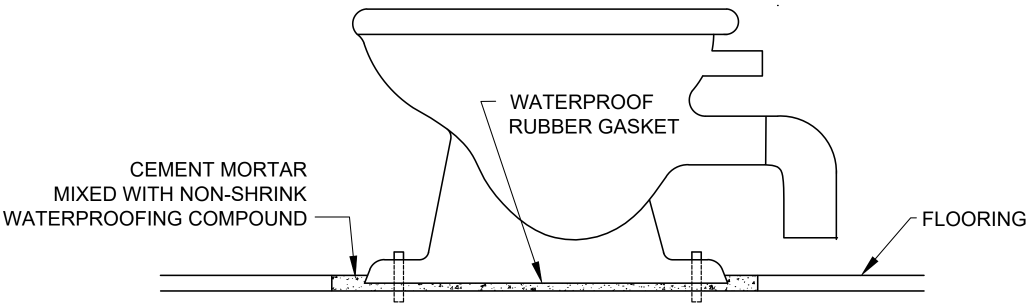
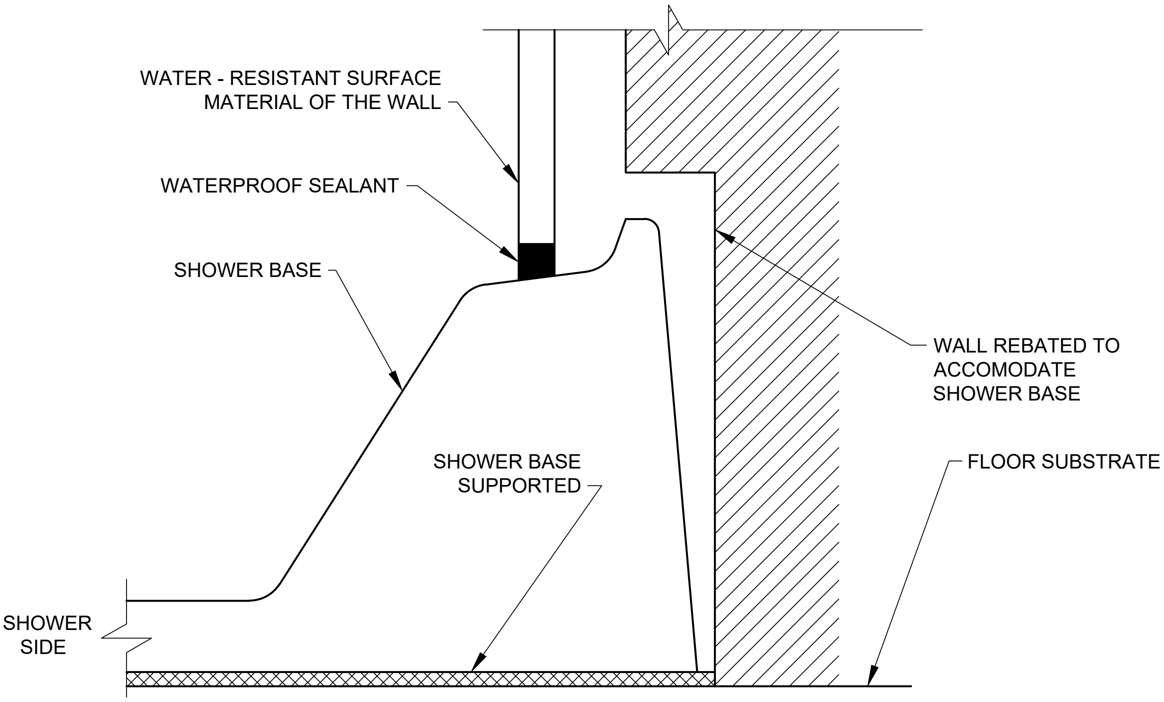
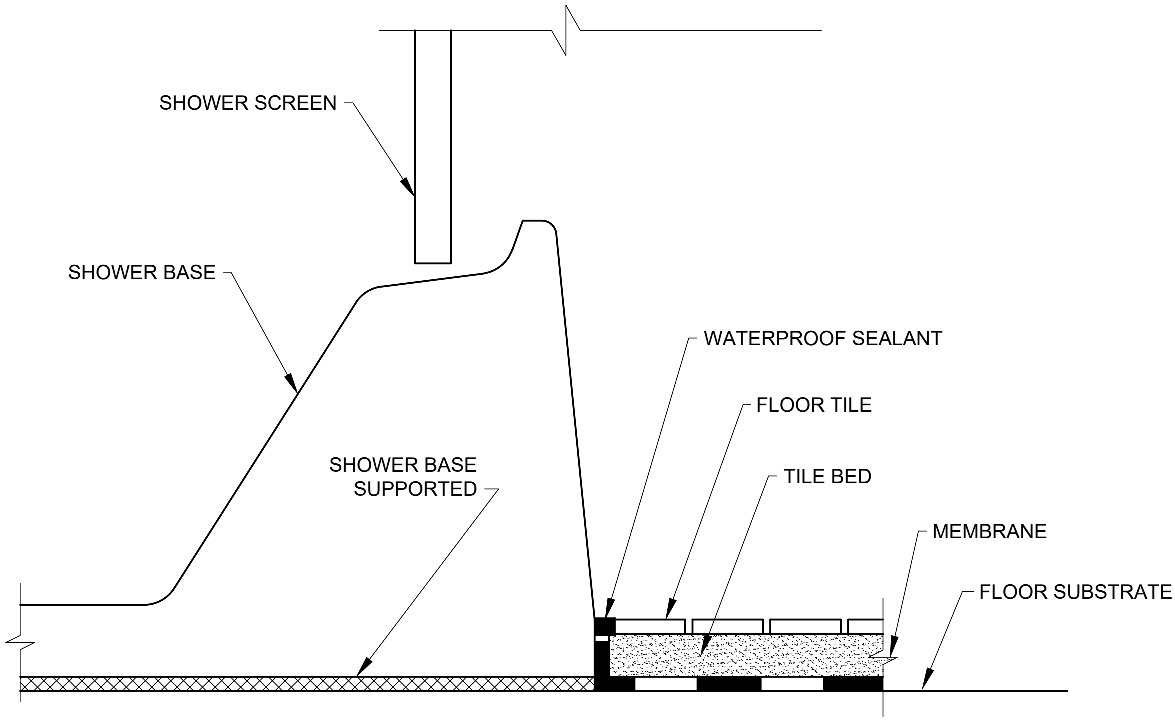


FIG. 5 FIXING OF EUROPEAN TYPE WATER CLOSETS


WATER - RESISTANT SURFACE MATERIAL OF THE WALL
WATERPROOF SEALANT
SHOWER BASE
WALL REBATED TO ACCOMODATE SHOWER BASE
FLOOR SUBSTRATE
SHOWER BASE SUPPORTED
SHOWER SIDE

6A TYPICAL PREFORMED SHOWER BASE WALL / FLOOR JUNCTION



6B TYPICAL PREFORMED SHOWER BASE / FLOOR JUNCTION

FIG. 6 TYPICAL PREFORMED SHOWER BASE JUNCTION

5.3.5 *General Shower Area Requirements*

5.3.5.1 *Substrate surface preparation for application of a membrane*

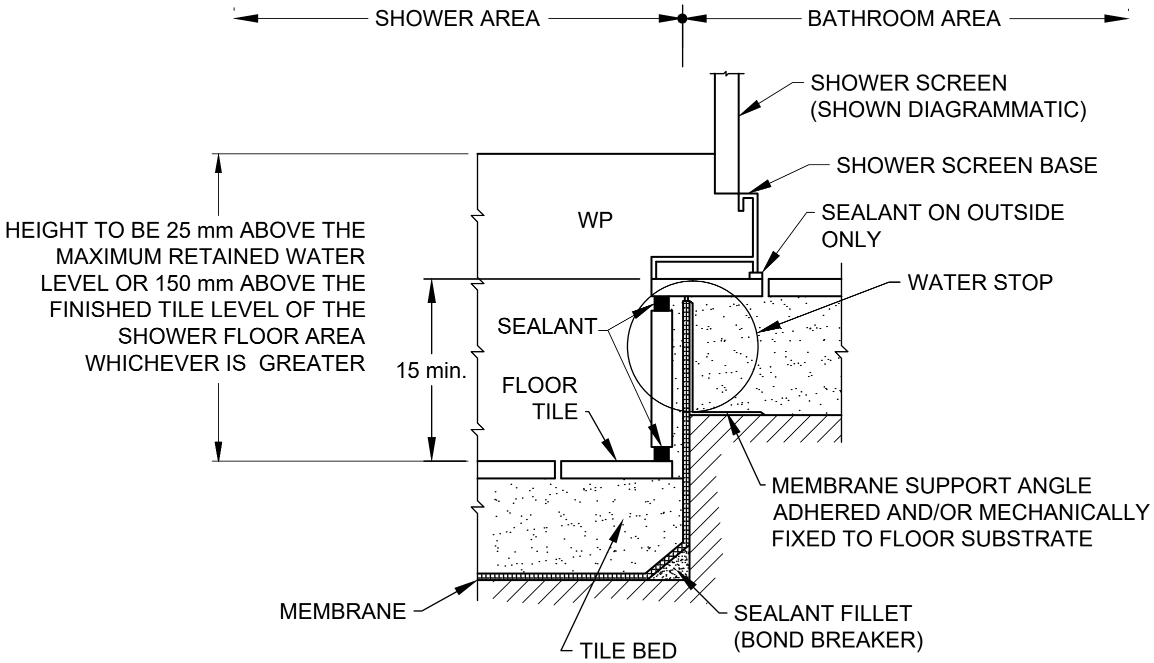
The area shall be cleaned and dust free. Indentations and imperfections shall be kept to a minimum and repaired where necessary.

5.3.5.2 *Step-down showers*

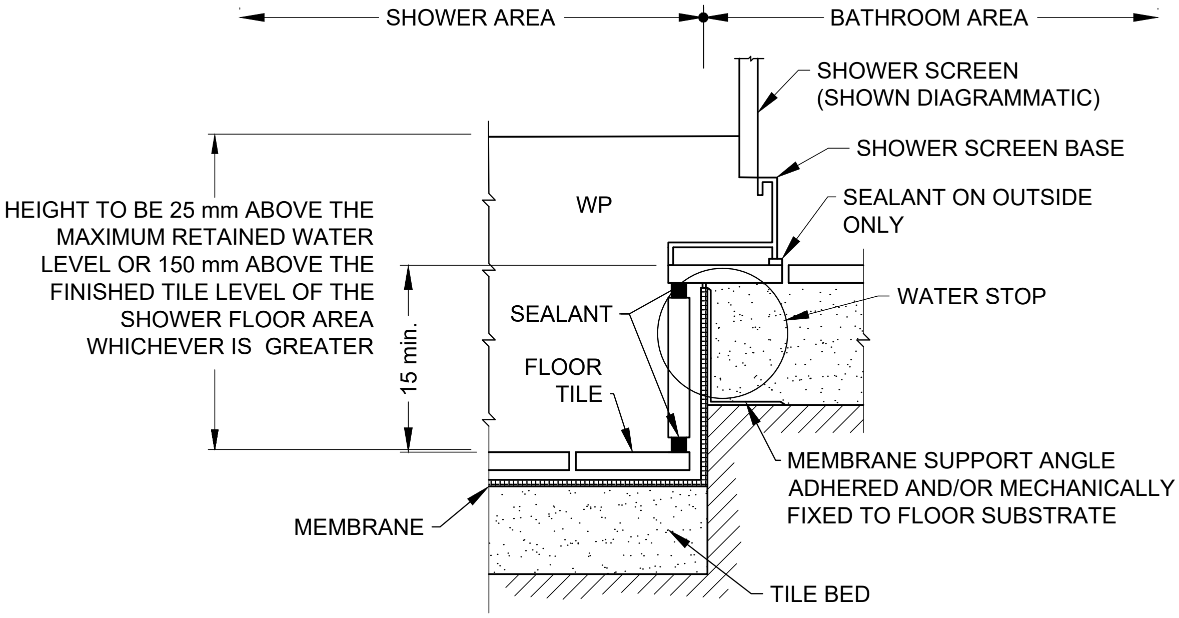
The highest finished floor level of the shower area shall be stepped down lower than the finished floor level outside the shower.

NOTE — For example, *see* Fig. 7.

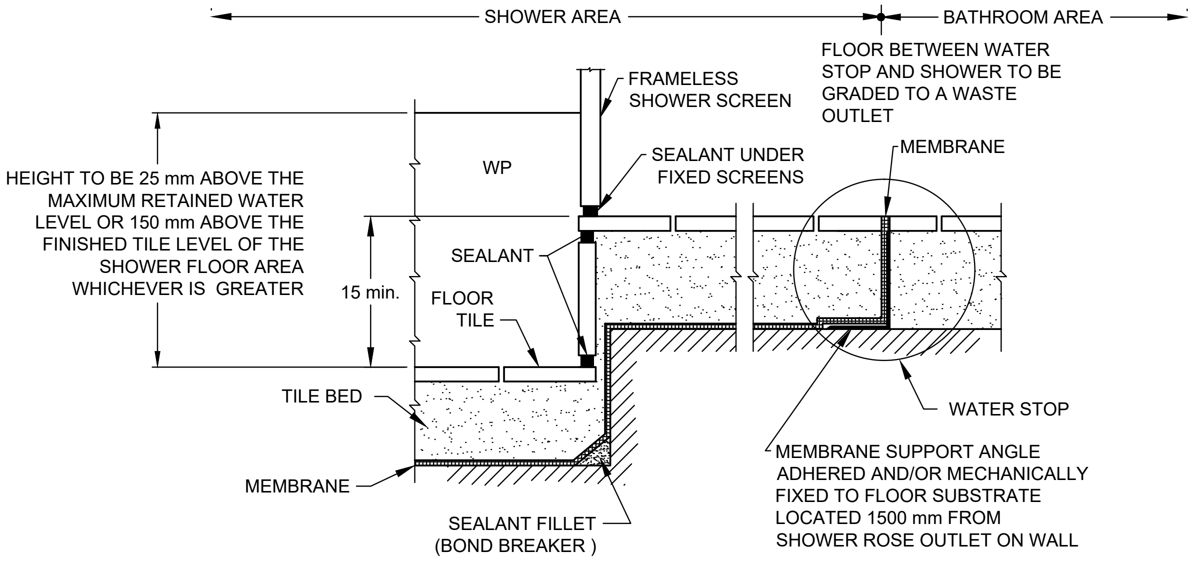
All dimensions in millimetres.


SHOWER AREA
BATHROOM AREA
SHOWER SCREEN (SHOWN DIAGRAMMATIC)
SHOWER SCREEN BASE
SEALANT ON OUTSIDE ONLY
WATER STOP
WP
HEIGHT TO BE 25 mm ABOVE THE MAXIMUM RETAINED WATER LEVEL OR 150 mm ABOVE THE FINISHED TILE LEVEL OF THE SHOWER FLOOR AREA WHICHEVER IS GREATER
SEALANT
15 min.
FLOOR TILE
MEMBRANE SUPPORT ANGLE ADHERED AND/OR MECHANICALLY FIXED TO FLOOR SUBSTRATE
MEMBRANE
SEALANT FILLET (BOND BREAKER)
TILE BED

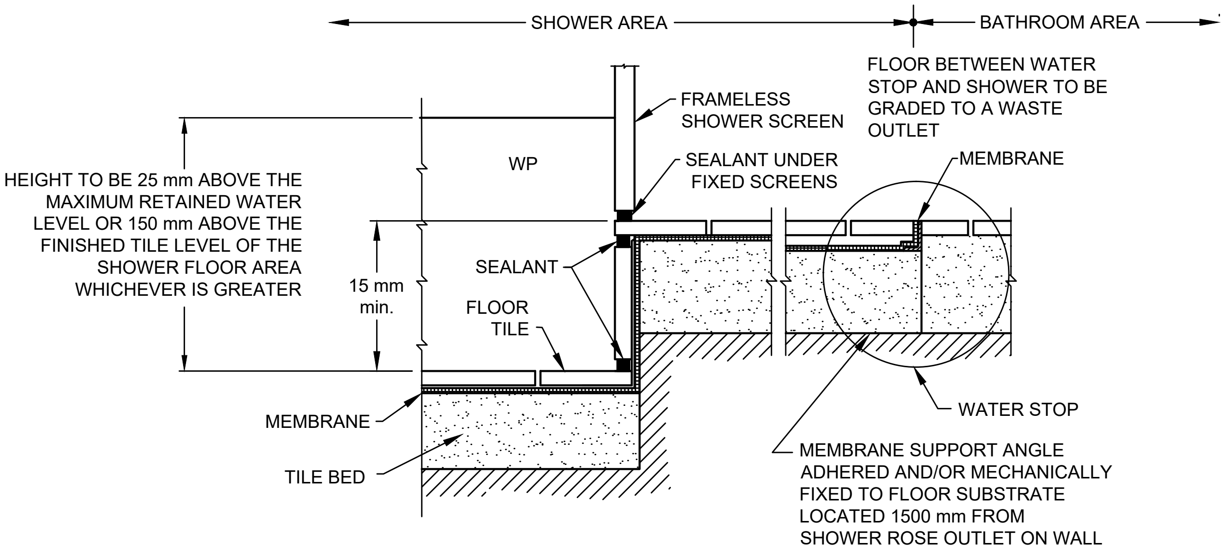
7A ENCLOSED SHOWER - MEMBRANE BELOW TILE BED


SHOWER AREA
BATHROOM AREA
SHOWER SCREEN (SHOWN DIAGRAMMATIC)
SHOWER SCREEN BASE
SEALANT ON OUTSIDE ONLY
WATER STOP
WP
HEIGHT TO BE 25 mm ABOVE THE MAXIMUM RETAINED WATER LEVEL OR 150 mm ABOVE THE FINISHED TILE LEVEL OF THE SHOWER FLOOR AREA WHICHEVER IS GREATER
SEALANT
15 min.
FLOOR TILE
MEMBRANE SUPPORT ANGLE ADHERED AND/OR MECHANICALLY FIXED TO FLOOR SUBSTRATE
MEMBRANE
TILE BED

7B ENCLOSED SHOWER - MEMBRANE ABOVE TILE BED


SHOWER AREA
BATHROOM AREA
FLOOR BETWEEN WATER STOP AND SHOWER TO BE GRADED TO A WASTE OUTLET
FRAMELESS SHOWER SCREEN
HEIGHT TO BE 25 mm ABOVE THE MAXIMUM RETAINED WATER LEVEL OR 150 mm ABOVE THE FINISHED TILE LEVEL OF THE SHOWER FLOOR AREA WHICHEVER IS GREATER
WP
SEALANT UNDER FIXED SCREENS
MEMBRANE
SEALANT
15 min.
FLOOR TILE
TILE BED
WATER STOP
MEMBRANE SUPPORT ANGLE ADHERED AND/OR MECHANICALLY FIXED TO FLOOR SUBSTRATE LOCATED 1500 mm FROM SHOWER ROSE OUTLET ON WALL
MEMBRANE
SEALANT FILLET (BOND BREAKER)

7C UNENCLOSED SHOWER - MEMBRANE BELOW TILE BED


SHOWER AREA
BATHROOM AREA
FLOOR BETWEEN WATER STOP AND SHOWER TO BE GRADED TO A WASTE OUTLET
FRAMELESS SHOWER SCREEN
HEIGHT TO BE 25 mm ABOVE THE MAXIMUM RETAINED WATER LEVEL OR 150 mm ABOVE THE FINISHED TILE LEVEL OF THE SHOWER FLOOR AREA WHICHEVER IS GREATER
WP
SEALANT UNDER FIXED SCREENS
MEMBRANE
SEALANT
15 mm min.
FLOOR TILE
WATER STOP
MEMBRANE
TILE BED
MEMBRANE SUPPORT ANGLE ADHERED AND/OR MECHANICALLY FIXED TO FLOOR SUBSTRATE LOCATED 1500 mm FROM SHOWER ROSE OUTLET ON WALL

7D UNENCLOSED SHOWER - MEMBRANE ABOVE TILE BED

FIG. 7 TYPICAL STEPPED DOWN SHOWER CONSTRUCTION

5.3.5.3 *Door jambs and architraves*

Where the bottom of door jambs and architraves do not finish above the floor tiling, the portion of doorframes and architraves below the floor tiling shall be waterproofed to provide a continuous seal between the perimeter flashing and the water stop. Flooring tiles shall be laid on top of a minimum 1 mm thick flexible and elastic acrylic cementitious waterproof coating which is seamless and acts as impervious membrane.

NOTES:

1 For typical door details (*see* Fig. 8).

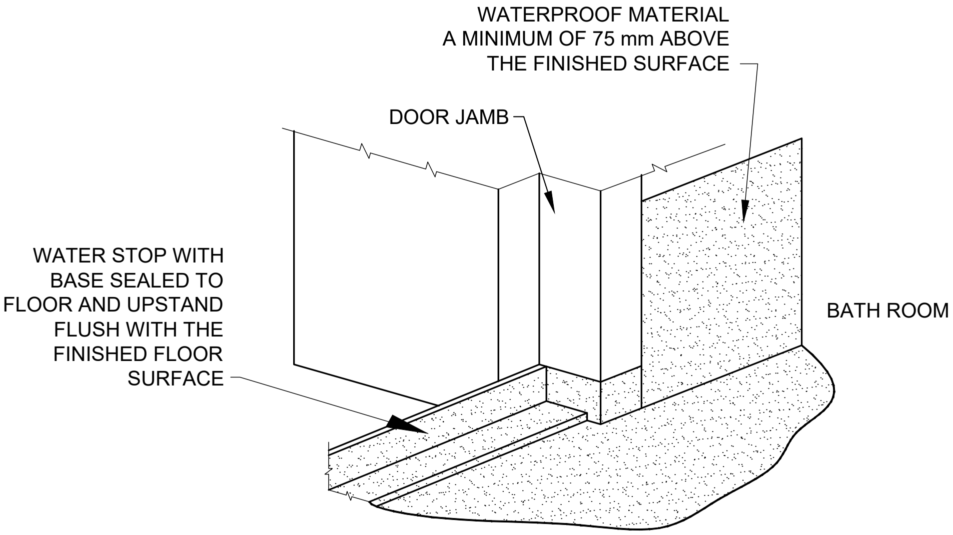
2 Where possible, the door jambs and architraves should be installed above the floor tiling.

5.4 Kitchen

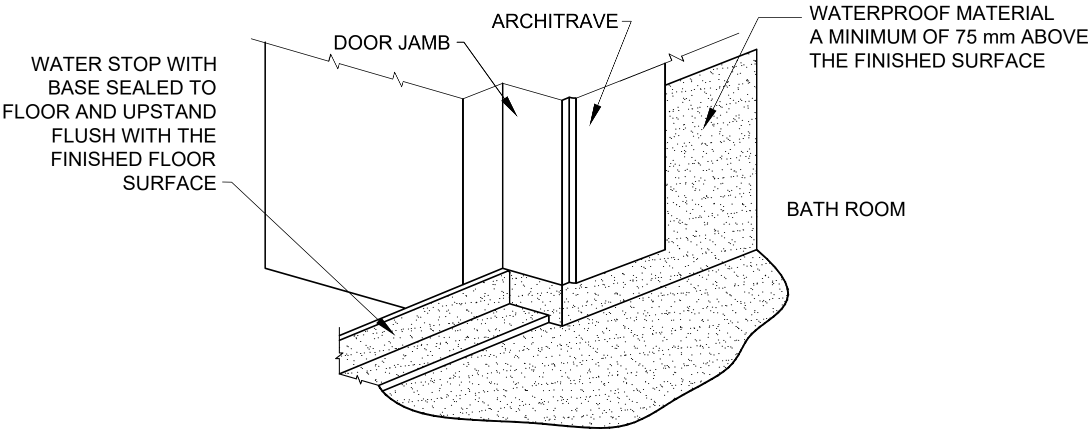
5.4.1 *Sources of Leakage and Dampness*

The following lists are some sources:

a) Type of sink and placement of draining board;



8A PRIOR TO INSTALLATION OF ARCHITRAVE



8B AFTER INSTALLATION OF ARCHITRAVE

FIG. 8 TYPICAL BATHROOM DOOR DETAIL FOR WHOLE BATHROOM WATERPROOFING

b) Area surrounding the sink; and the slope of the kitchen platform;

c) Joints between the sink and draining pipe;

d) Junction joint between kitchen platform and the wall;

e) Improper ventilation leading to condensationl

f) Floor traps (*see* **5.6**); and

g) Floor level washing place.

5.4.2 *Recommendations for Prevention of Leakage and Dampness*

The following recommendations shall be considered:

a) Sink used should conform to the relevant Indian Standards [such as IS 13983, IS 771 (Part 2)] for its quality. Draining board used with the sink should be placed in such a way that water which is being drained does not find way towards the wall and it should overlap the side of the sink (*see* Fig. 9).

b) The junction of sink and platform shall be taken care of as per Fig. 10. It is recommended to insert the sink edge between the *Kadappa*/second quality marble and the finishing material. The sink is to be fixed using epoxy for its entire inserted length, leaving 2 to 3 mm from external face to be filled using silicon sealant. The silicon sealant should be replaced at the end of its life cycle.

c) Joints between sink and draining pipe should be leak-proof.

d) Drainpipe from sink must discharge effectively into the floor trap. Preferably a cleanout junction should be used to facilitate periodical rodding.

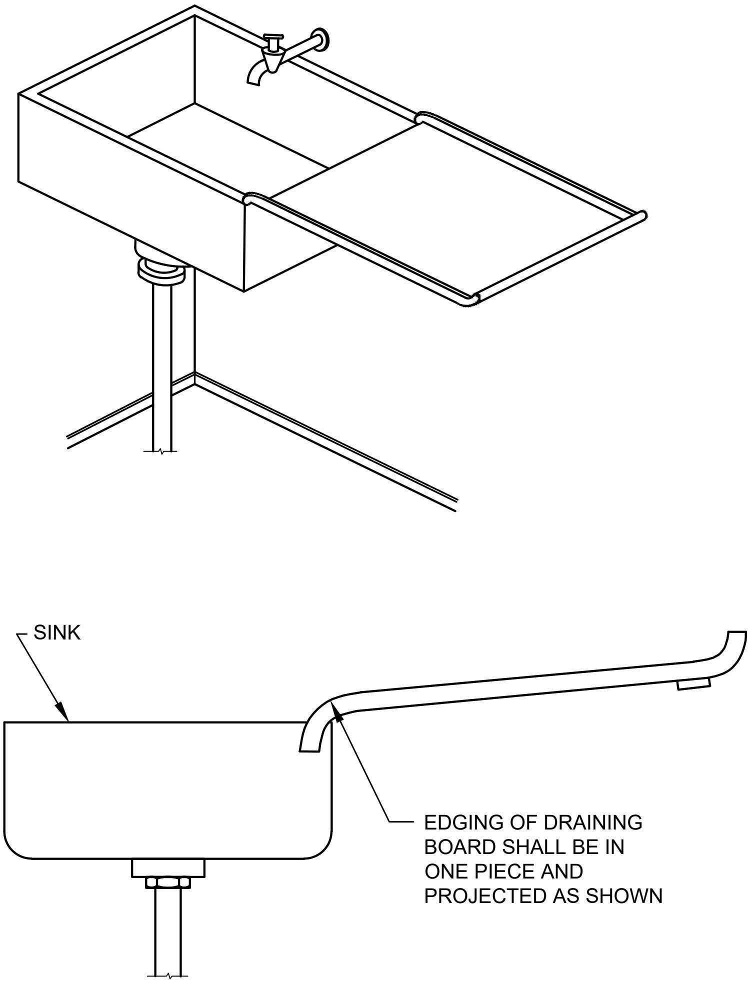

SINK
EDGING OF DRAINING BOARD SHALL BE IN ONE PIECE AND PROJECTED AS SHOWN

Fig. 9 Typical Arrangement of Placement of Draining Board

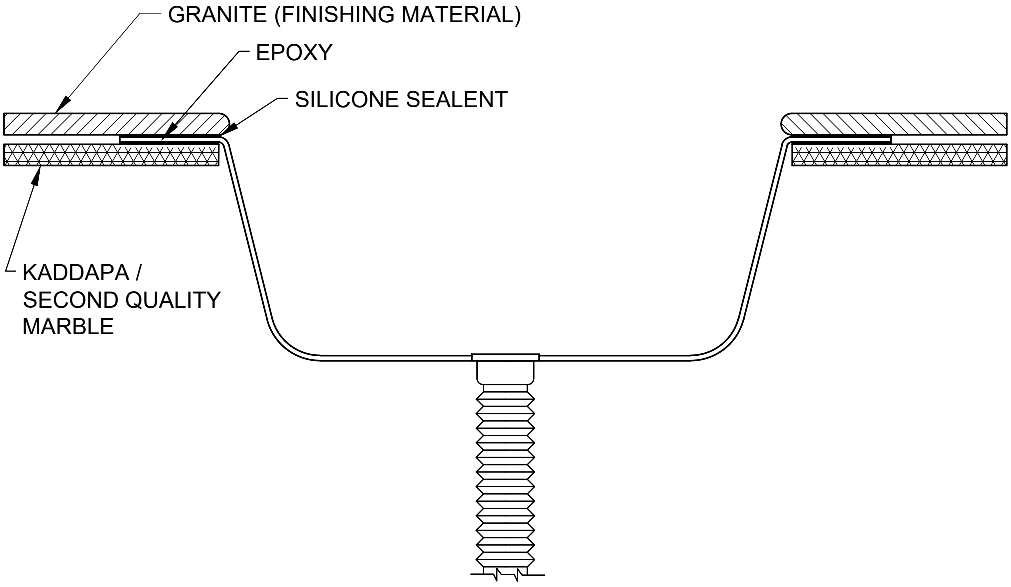


Fig. 10 Sink Detail

e) Kitchen slabs made of stone or precast cement concrete slabs are normally fixed by inserting into the wall by making a chase which can become source of seepage. To avoid seepage, a skirting should be provided at the junction point.

f) Kitchen floor should preferably be joint-less or with waterproofed fine joints where joints are unavoidable.

g) Proper ventilation should be provided in the kitchen to avoid condensation. For this, exhaust fan may be fixed on the wall exposed to atmosphere.

h) Where floor level sink is provided, the entire floor of the washing place should be sunk by 25 mm for the surrounding floor and should be treated as indicated in **5.2.2**(e)(3).

j) A uniform slope of not less than 1 in 100 should be provided to the washing floor towards drainage points with a floor trap.

5.5 Open *Verandah*, Balconies and *Chajja*

5.5.1 *Sources of Leakage and Dampness*

Some sources of leakage and dampness are:

a) Inadequate protection from rain water,

b) Improper slope and level,

c) Improper and inadequate opening for draining off water,

d) Non-provision or improper drip course or throting (nosing),

e) Improper practices of raising flower bed and potted plants, and

f) Junction of *Chajja* and wall.

5.5.2 *Recommendations for Waterproofing and Damp-Proofing*

The recommendations given hereunder shall ensure adequate waterproofing and damp-proofing of open *Verandah*, balconies and *Chajjas*:

a) Drops and parapet should be provided to protect open *Verandah* and balconies from rain.

b) Open verandah and balconies should have a slope of 1 in 100 to drain off the water effectively.

c) Where open *Verandah* or balconies are provided with solid parapet wall or skirting is provided then spouts of adequate diameter and length should be provided at the floor level to drain off water or the area should be drained through a drain pipe of at least 75 mm diameter. Connection of the pipe opening and the vertical pipe should be made waterproof.

d) Proper drip course/throting should be provided to throw off the water effectively.

e) Floor of open *Verandah* should be sunk by 25 mm and made from impervious material.

f) Fillet should be provided at the junction, point of wall and *Chajja* as shown in Fig. 11.

g) To be treated by polymeric cementitious coating of zero permeability at 1 bar hydrostatic water pressure.

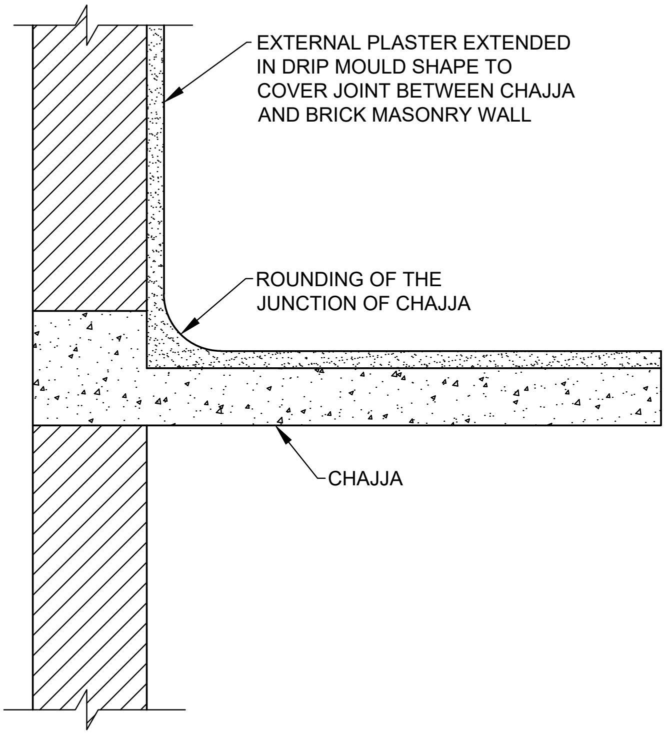

EXTERNAL PLASTER EXTENDED IN DRIP MOULD SHAPE TO COVER JOINT BETWEEN CHAJJA AND BRICK MASONRY WALL
ROUNDING OF THE JUNCTION OF CHAJJA
CHAJJA

FIG. 11 FILLET AT THE JUNCTION POINT OF WALL AND *CHAJJA*

h) Discharge outlet shall be kept away from wall as far as possible.

5.6 Floor Traps

Sanitary appliances differ from each other in the case of water closet, bath room and kitchen. However, floor trap is a common fitment to all. Improper design and installation of floor traps causes dampness and leakage in the building. For avoiding the dampness, traps should fulfil the following requirements:

a) It shall pass the used water freely without mechanical aid.
b) It shall prevent passage of foul air.
c) It shall be strong and proof against all leakage of gas or liquid.
d) It shall be self cleansing.
e) It shall have no mechanical moving part.
f) It shall have no recesses, cavities and pockets.
g) It shall have smooth surface without any internal projections.
h) It shall be capable of maintaining water seal under all condition of flow.

5.6.1 *Defective Installation*

Following are some of the installation defects:

a) Installation where the trap is sealed deep from the floor level and there is gap between the floor level where the *Jali* grating of the floor trap is kept and main body of the floor trap.
b) Installation where one or more pipes empty into the floor trap and either some pipe do not come up to the trap or a pipe overshoots the floor trap.
c) Improper location of floor traps, fittings and slope in floor.
d) Faulty jointing of the trap with drain pipes (*see* Fig. 12).
e) Loosely fixed floor traps.

5.6.2 *Recommendations for Prevention of Leakage/ Dampness through Water Traps*

5.6.2.1 *Installation*

The following installation techniques aid in prevention of leakage/dampness through traps:

a) When floor trap is almost at the floor level, whenever a great amount of water is suddenly spilt, a pool of water is created around the trap which may cause dampness. To prevent this, a well defined waterproof depression should be constructed around the trap. Waterproofing of the depressed area should be done as explained in **5.2.2**(e)(3).
b) The depression in the RCC slab for fixing of floor traps in kitchen and bath should be adequate.
c) When trap is located deep into the floor space, additional piece of pipe shall be provided to avoid any gap between floor level and top of the trap. For this a galvanized iron or MS pipe which is custom built and which can be lead caulked properly with trap should be used (*see* Fig. 12).
d) For making the joints of the cast iron pipes and traps proper, a measuring mug made from galvanized sheet having capacity to have the quantity of lead as per the specification, shall be used. The quantity of molten lead to be used shall be marked in the mug. Mug shall be filled with molten lead up to the mark and all the lead shall be poured in the joint with the help of a iron spoon.
e) Smoke test/air test may be carried out before covering the joints from the tap to the stack.
f) By using suitable non-shrink waterproof grout (its chloride limit should be less than one percent in the waterproofing agent).

5.7 Pipe Work for Building

5.7.1 *Recommendations for Installation of Soil and Drainpipes in a Building to Avoid Dampness/Leakage*

The following recommendations are suggested:

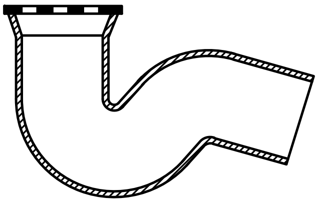
a) Pipe work and appliance should be so arranged as to allow close grouping of connections preferably with closet near the main soil pipe.
b) All joints in pipe work and of pipe work to appliances should be done according to IS 1742. Care should be taken to ensure that no jointing material project inside the bore of the pipe.
c) Ample provision should be made for access to all pipe work. The embedding or joints in walls should be avoided as far as possible.
d) Soil and wastepipe shall be kept clear of the wall to avoid dampness in the wall in case of leakage. Fixed screw type grating should be preferred.
e) In case of soil pipe, fitment with inspection door should be provided at suitable location. Bolts of the inspection door of a fitments in the pipeline should be of non-rusting material.
f) The pipe shall be covered with a double-sided bituminous waterproof tape and filled with non-shrink grout for better bonding with concrete, free of chlorides.

5.8 Water Tank

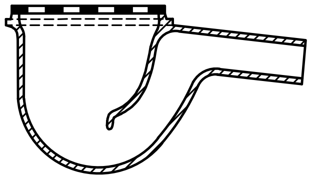
5.8.1 *Sources of Leakage*

Some common sources of leakage are:

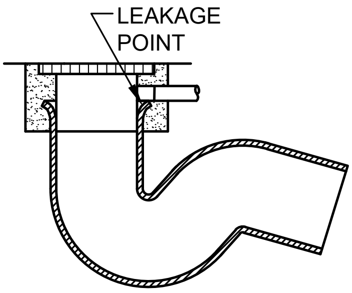
a) At the junction of the tank wall and various pipe fittings in a wall;
b) Under the tank on account of usage of scour valve;



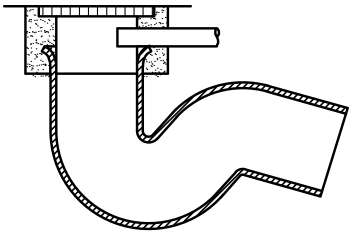
1 CORRECT TYPE OF FLOOR TRAP



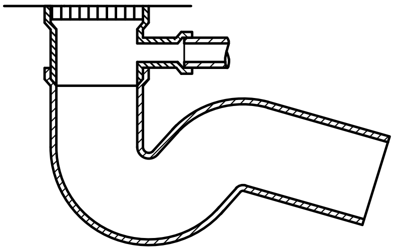
2 INCORRECT TYPE OF FLOOR TRAP - PARTITION TYPE. THIS IS NOT SELF-CLEANSING AND HAS PROJECTION WHERE IT CAN GET CLOGGED



3 WHEN A WASTE PIPE DISCHARGES INTO THE FLOOR TRAP BELOW FLOOR LEVEL WHERE THE JUNCTION IS MADE OF CEMENT, CONCRETE; POINT `A' BELOW THE PIPE IS VULNERABLE AS A LEAKAGE POINT DUE TO IMPROPER COMPACTION OF CONCRETE BELOW PIPE



4 MORE OFTEN THE WASTE PIPE IS NOT CUT TO THE EXACT SIZE, IT MAY BE SHORT AS IN (3) OR OVERSHOOT THE EDGE AS IN (4) WHICH AGAIN CAUSES FLOODING OF WATER AND WATER MAY FIND ITS WAY INTO THE FLOOR FILLING BELOW



5 THE CORRECT METHOD OF MAKING THIS JOINT IS TO HAVE A G.I. OR M.S. CUSTOM BUILT JUNCTION WITH LEAD CAULKED JOINTS

FIG. 12 FLOOR TRAPS

c) Overflow from the tank;

d) Vegetation around the tank;

e) Leakages through the pipelines due to disturbance on account of traffic; and

f) Junction of terracing with tank support columns.

5.8.2 *Recommendations for Prevention of Leakages and Dampness*

The following recommendations shall be considered:

a) The junction between tank wall and of outlet and inlet fittings have to be made with proper rubber/nylon washers to ensure water tightness. The junction of outlet and inlet fittings shall be covered with a double-sided bituminous waterproof tape and filled with non-shrink grout for better bonding with concrete, free of chlorides.

b) While draining the tank, water may seep into the terrace. The area of terrace under the tank being in the shade does not get dried quickly. The terrace below the tank, therefore, should be given double treatment for waterproofing. Clearance between the terrace level and tank should be at least 1 m to facilitate repairs, if any. The scour pipeline should be led to suitable outlet to avoid damage to terracing due to flow of water. The pipe line should be capable of being cleared during maintenance.

c) Overflow from the overhead tank should not fall freely on the terrace damaging the waterproofing treatment. Overflow should be led to a rain water pipe or any other outlet and should end in a mosquito proof coupling.

d) Under the overhead tank vegetation like *peepal*, lichen, moss, etc, can grow damaging continuity of waterproofing layer thus providing direct access to the water to the building fabric. Special care has to be taken to avoid nooks and corners where moisture would encourage speedy growth of vegetation. Frequent inspections are necessary to remove vegetation.

e) On the terrace long horizontal lengths of piping are laid from the overhead tank to the shaft wherever water pipelines are taken down. These pipelines should be placed on proper pillars. The persons working on the terrace may step on these pipelines, thus damaging the joints through which water leakages can take place. In addition, wherever these long lengths of pipelines have reverse level air lock can take place, therefore, such situation should be avoided.

f) The tank supports which may be of brick masonry, RCC and steel should have proper flushing with terracing.

5.9 Sanitary Shaft

5.9.1 Sources of leakages and dampness include,

a) rain;

b) leakage from both water and sanitary pipelines;

c) rigidity of piping with respect to the building; and

d) dampness due to bad ventilation.

5.9.2 *Recommendations for Prevention of Leakages/Dampness*

The recommendations for prevention of leakage/dampness include the following:

a) Raise the shaft/duct above the terrace slab by at least 600 mm. The duct size should be designed to facilitate movement of one person. The shaft/duct should be closed adequately from the top.

b) In case of water supply and sanitary piping, in course of time, some deficiencies in the maintenance may lead to pipe leakage. If pipes are placed on the wall, the leaked water will create dampness. In the case of sanitary piping it should be separated by 100 mm from the wall surface and the water supply line should be separated by 40 mm from the surface.

c) Pipes made of cast iron are rigid compared with building. With seasonal variation of temperature, buildings will have horizontal and vertical displacement. The pipe connections to the wall should be capable of absorbing these changes in the sanitary shaft in the vertical and horizontal directions. Use of flexible materials like lead for jointing allows certain amount of movement whereas the cement joint will not allow the same. Embedding of pipes on the shaft walls or any other building portion increases the problems of such changes due to seasonal variations and special care has to be taken to allow for the freedom of movement while designing the pipe system along with shaft.

d) Sanitary shaft should be so designed that condensation of water does not take place.

5.10 External Wall

5.10.1 *Reasons and Sources for Dampness*

The reasons and sources for dampness include the following:

a) Use of non-waterproof cladding;

b) Nooks and corners which collect water;

c) Projections, like sun shades, balconies and porches;

d) Projections from walls which create suction areas around the building thereby encouraging larger amount of rain to settle on the wall surface;
e) Vegetation including moss and lichen;
f) Bands; and
g) Wall, slab soffit junction.

5.10.2 *Recommendations for Prevention of Dampness*

The following suggestions aid in preventing dampness:

a) Non-waterproof cladding is not to be allowed, such as stone tiles with open joints. Extremely rough surface which would allow water to stagnate should be avoided,
b) External walls in conjunction with horizontal sills should not give rise to places where water can collect. All such areas should be drained properly either by providing heavy slope and/or by proper waterproofing material.
c) Projections like *Chajjas*, balconies and porches, should be so constructed, that they do not retain water (by edges on the end, thus, forming a tank).
d) Projections from the external wall should be properly designed to avoid the wall affect if the wind pattern around the buildings which in some cases gives rise to heavy suction areas.
e) Vegetation like moss, lichen, decorative climbers, creepers which cause dampness in the wall should be periodically removed.
f) Bands should be properly sloped otherwise they help water to settle on the top of the surface causing dampness on the external walls.
g) Junction between walls, and slab soffit shall be properly sealed.

5.11 Slopes in Floor Finishes

Where required, slopes in floor finishes shall allow all surface water to drain without ponding except for residual water remaining due to surface tension.

For general bathroom floor area, the minimum slope to the drain shall be between 1 : 50 and 1 : 60.

NOTE — For information on slopes in the floor finishes, *see* Annex C.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
456 : 2000	Code of practice for plain and reinforced concrete (*fourth revision*)
702 : 1988	Specification for industrial bitumen (*second revision*)
771 (Part 2) : 1985	Specification for glazed fire-clay sanitary appliances: Part 2 Specific requirements of kitchen and laboratory sinks (*third revision*)
875	Code of practice for design loads (other than earthquake) for buildings and structures
(Part 2) : 1987	Imposed loads (*second revision*)
(Part 3) : 2015	Wind loads (*third revision*)
(Part 4) : 1987	Snow loads (*second revision*)
(Part 5) : 1987	Special loads and load combinations (*second revision*)
1742 : 1983	Code of practice for building drainage (*second revision*)
1905 : 1987	Code of practice for structural use of unreinforced masonry (*third revision*)
2095	Specification for gypsum plaster boards
(Part 1) : 2011	Plain gypsum plaster boards (*third revision*)
(Part 2) : 2001	Coated/laminated gypsum plaster boards (*second revision*)
(Part 3) : 2018	Reinforced gypsum plaster boards, tiles, cornices and mouldings (*third revision*)
2645 : 2003	Specification for integral waterproofing compounds for cement mortar and concrete (*second revision*)
10262 : 2019	Guidelines for concrete mix proportioning (*second revision*)
10701 : 2012	Specification for structural plywood (*first revision*)
13983 : 1994	Specification for stainless steel sinks for domestic purposes

ANNEX B

(*Foreword*)

DESIGN CONSIDERATIONS FOR WATERPROOFING OF WET AREAS

B-1 GENERAL

This annex provides information that should be considered when designing waterproofing systems for wet areas in domestic buildings and includes guidelines for dealing with the degree of risk, and the types of materials used and their locations in construction.

B-2 LEAKAGE THROUGH FINISHES

Water may penetrate wall and floor finishes in wet areas, depending on frequency, intensity and length of time these surfaces are exposed to water; if not intercepted, water may damage the moisture-sensitive materials lying beneath, and sometimes reach adjoining rooms and their finishes. Consequently, careful attention should be paid to the design and installation of all materials, components and systems to prevent damage by water.

Water penetration mainly occurs at joints. Grouted joints will often shrink, producing cracks that allow water to pass through. At floor and wall junctions, these cracks can be caused or enlarged by movement of the structure, substrate or that of finishes.

B-3 MOVEMENT AND WATERPROOFING

B-3.1 General

Movement in the wall and floor structure is often caused by contraction, expansion or settlement. Users of this standard should be aware of the need for waterproofing materials or systems to accommodate the expected movement of the structure.

B-3.2 Structure Movement

B-3.2.1 *Frame Movement*

Potential movement of corner studs is restricted if the studs are fastened to intermediate blocking pieces. Where the framing is constructed of metal or seasoned timber, blocking is generally a provision to restrict structural deflection. Unseasoned timber requires additional consideration for movement and its subsequent effects upon the waterproofing system.

B-3.2.2 *Masonry Movement*

Masonry products, such as clay-based materials, cement-based materials and autoclaved aerated materials may be subject to specific movement characteristics depending on the material used. These products also require consideration of movement and its subsequent effects upon the waterproofing system.

B-3.2.3 *Panel Movement*

Panel products are also subject to movement, particularly at joints. Such products also require consideration of movement and its subsequent effects upon the waterproofing system.

B-3.3 Wall Linings under Tiles in Shower Areas

While it is considered that the faces of the nominated linings are impervious enough to shield wall framing against damage from water that penetrates tiled finishes in wet areas, the joints between lining sheets and their junctions with other materials may require special attention to intercept or stop the natural path of water through them.

Of major concern are the vertical corner joints and the perimeter joints where the potential for shrinkage and structural movement of the framing is greatest. Therefore, vertical corner joints should be provided with flashing angles and sealant for surface finishes.

B-3.4 Prefinished Wall Panels

Vertical joints between panels and their horizontal junctions with other materials should be carefully considered, as the panels are the only barrier between the water and the framing beneath. All joints between panels should be either flashed or waterproofed with a sealant, and the bottoms of panels installed to overlap adjoining materials.

B-3.5 Floors

B-3.5.1 *General*

Waterproof barriers are required to prevent downward or sideways movement of water into adjoining construction or rooms.

Water naturally penetrates tiled floor finishes more readily than wall finishes. Where a tile bed is used, a waterproof membrane may be installed above or below the tile bed. Where a membrane is installed above a tile bed, it is essential that the tile adhesive be compatible with the membrane.

Where the membrane is under the tile bed, the tile bed tends to become a reservoir of moisture. A drainage system should be provided within the tile bed, over an *in-situ* membrane. This allows the reservoir of moisture to discharge into the drain fitting or pipe (*see* Fig. 13).

B-3.5.2 *General Requirements of Barriers*

In order to maintain waterproofing integrity, trays or flashing angles should be installed in a manner that allows for the expected movements of the supporting structure. *In-situ* membranes and flashings should be able to cover floor-to-wall and wall-to-wall joints without tearing or breaking under the forces exerted on them when movement occurs in the adjacent elements to which they are fixed.

For framed construction, prefabricated flashing angles should be adhered only to the floor, allowing the sides of the vertical legs to accommodate the differential movement between walls and floors.

B-3.5.3 *In-situ Barriers — Properties and Installation*

Some of the materials specified for *in-situ* membranes or flashings are not considered sufficiently elastic to

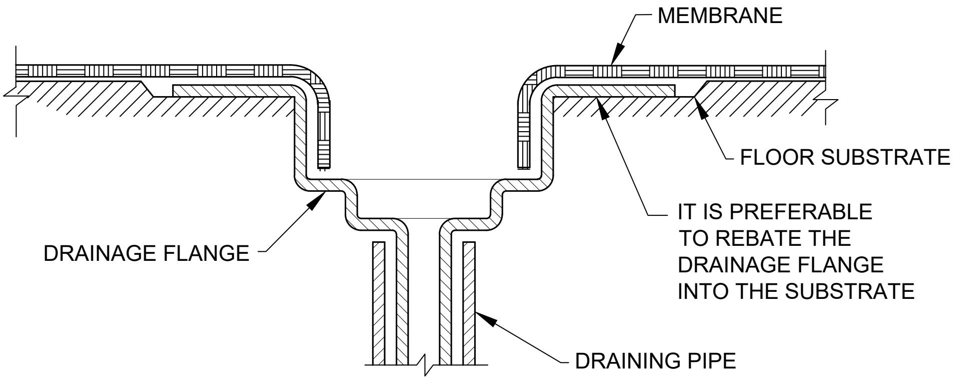


Fig. 13 Typical Membrane Termination at Drainage Flange

stretch without tearing, or flexible enough to bend without breaking when subjected to joint movement. Therefore, such barriers should not be applied directly across the joint, and should be completely bonded to both adjacent surfaces. The correct approach is to first install a 'bond-breaker' at the wall/floor junction. This bond-breaker may consist of any of the following depending on the class of the membrane:

a) A flexible closed cell foam-backing rod combined with a suitable bond-breaker tape;
b) A suitable sealant; and
c) Bond-breaker tape.

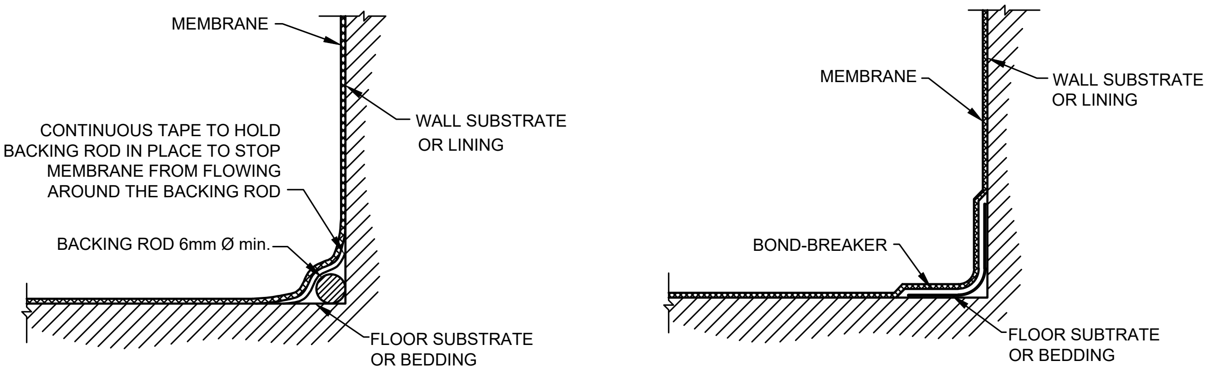
The method used should be directly related to the type of membrane installed. More rigid membrane and flashing materials, which bend rather than stretch, are better suited for use with a backing rod and bond-breaker tape (*see* Fig. 14).

B-3.5.4 *Set-Downs*

Vertical edges of the set-downs should align flush with the wall substrate to avoid creating voids, cavities or protrusions. They should be repaired prior to installation of a waterproofing system, as they are the cause of many waterproofing problems.

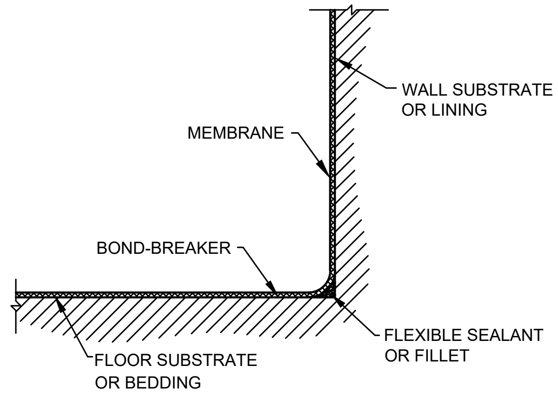
B-3.5.5 *Tiles within Shower Area*

Small dimension tiles used in shower areas enable the tiler to achieve the necessary slope to the drain as the size of the tiles increase adequate slope may be more difficult to achieve.


MEMBRANE
WALL SUBSTRATE OR LINING
CONTINUOUS TAPE TO HOLD BACKING ROD IN PLACE TO STOP MEMBRANE FROM FLOWING AROUND THE BACKING ROD
BACKING ROD 6mm Ø min.
FLOOR SUBSTRATE OR BEDDING
MEMBRANE
WALL SUBSTRATE OR LINING
BOND-BREAKER
FLOOR SUBTRATE OR BEDDING

14A CLASS I MEMBRANE

14B CLASS II MEMBRANE



14C CLASS III MEMBRANE

Membrane Class	*Elongation at Break*	*Tensile Strength* N/mm^2	*Min Bond Breaker / Tape Width to Bridge Joints Opening up by 5 mm*
I	< 60 percent	> 0.5 to 1	75 mm with backing rod
II	60 percent to 300 percent	> 1 to 1.5	35 mm
III	> 300 percent	> 1.5	12 mm

FIG. 14 TYPICAL BOND BREAKER DETAILS

ANNEX C

(*Clause* 5.11)

SLOPES IN FLOOR FINISHES

C-1 GENERAL

The primary consideration for slope in floor finishes is to ensure water does not remain on the finished floor in a manner that can adversely affect the health or amenity of occupants or deteriorate the building elements.

Slope in floor finishes should ensure water exits the area at the floor drain or doorway if that is the designed exit point (for example, laundry door to exterior). Water should not pond on the floor, with the exception of residual water remaining due to surface tension.

C-2 FACTORS AFFECTING SLOPE

The ratio of slope achieved in a floor may vary depending upon,

a) finished height requirements at doorways;

b) height of fixtures or fittings;

c) dimensions of the tiles used, adequate slope become more difficult to achieve as the size of the tiles used increases;

d) area of the floor to be drained; and

e) requirements of persons with disabilities.

C-3 SLOPE RATIOS

Clause **5.3.2** (a) specifies a slope ratio between 1:50 and 1:60 in shower areas. Where slope flatter than 1:100 are proposed, the effectiveness of the floor drainage should be confirmed to ensure the primary consideration given in **B-1** has been met.

C-4 DIAGONAL CUTTING OF TILES

Tiles may require diagonal cutting in the area around the drain to achieve the required slope, sufficient drainage and to ensure lipping is kept to the optimum requirement mutually chosen between the parties.

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Water Proofing and Damp-Proofing Sectional Committee, CED 41

Organization	*Representative(s)*
In Personal Capacity (*Former ADG, CPWD, F-33, Sector – 39, NOIDA – 201303*)	Shri Ajai Kumar Bhatnagar (***Chairman***)
Ahluwalia Contracts India Ltd, New Delhi	Shri Pradeep Kumar Shri J. S. Rawat (*Alternate*)
Assess Buildchem Private Limited, Navi Mumbai	Shri Samir Surlaker Shri Sunny Surlaker (*Alternate*)
BASF Construction Chemicals (I) Pvt Ltd, Mumbai	Shri Jaswinder Singh
Builders Association of India, Mumbai	Representative
Central Public Works Department, New Delhi	Superintending Engineer (TAS) Executive Engineer (TAS) II (*Alternate*)
Construction Chemicals Manufacturers' Association, Mumbai	Shri M. A. Waheed Shri Gangadharan Manari (*Alternate*)
CSIR-Central Building Research Institute, Roorkee	Dr Sukhdeo R. Karade Shri P. C. Thapliyal (*Alternate*)
Engineers India Limited, New Delhi	Shri Samir Das Ms Jyotsna Shridhar (*Alternate*)
Forsoc Chemicals (India) Pvt Limited, Bengaluru	Shrimati Nidhi Raina
GCP Applied Technologies India Pvt Ltd, Gurugram	Shri Prakash Chandra Ms Likita Lingapuri (*Alternate*)
Indian Concrete Institute, Chennai	Shri Vivek Naik Shri Supradip Das (*Alternate*)
IWL India Limited, Mumbai	Shri Ashok Bansal Shri M. L. Muthiah (*Alternate*)
Kasturi Projects Pvt Ltd, Thane	Shri K. R. Pai
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MES Builders Association of India, New Delhi	Representative
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